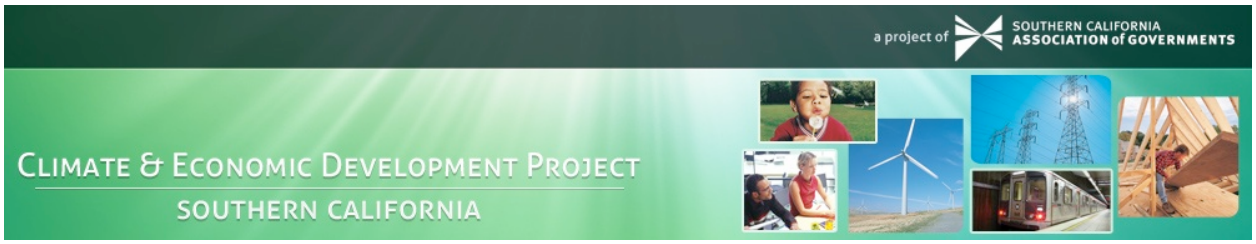


http://cedp.scag.ca.gov

Draft Firm-Size Impacts of AB 32 & SB 375 on the SCAG Economy: Methodological Summary

I. Introduction and Overview

The purpose of this memorandum is to summarize the methods, data sources, and assumptions that will be used to estimate the firm-size impacts on the SCAG Region of SB 375 and AB 32 policies and measures.[1] As an adjunct to analyzing the macroeconomic impacts of greenhouse gas (GHG) mitigation/sequestration policy options that the Project Stakeholder Committee selects as priorities for analysis, CCS will also evaluate the extent to which the impacts of policy options differ by firm-size by industry. The firm-size analysis will benefit from the availability of sector-specific outputs produced in the macroeconomic impact analysis. As described in more detail in the Macroeconomic Impact Analysis methods memorandum, the macroeconomic impact analysis will utilize the Regional Economic Models, Inc. (REMI) Policy Insight Plus (PI^+) and REMI Transight (TS) models to evaluate the combined effects of both the direct and indirect economic impacts of GHG policies (CCS, 2010). The outputs from these models will be used in concert with estimates of policy option costs (or savings) by industry- and firm-size category to determine the extent to which policy options differentially impact firms of different sizes.

The memorandum is divided into six sections. Section II summarizes the use of outputs from the REMI models in the impacts analysis. Section III discusses the use of additional data in the analysis, including sales data that SCAG has previously procured from InfoUSA. Section IV highlights the outputs and conclusions that will be generated from the analysis. Section V presents a hypothetical firm-size impact analysis. This memorandum concludes with citations to the references that were consulted in preparing this document.

II. REMI PI^+ and TS Model Outputs

[1] Note that data sources will limit the ability to characterize impacts on firms—given the complexities of business organization, it is impossible to perform a firm-level analysis without characterizing each individual entity affected by each potential option and each entity's ultimate parent owner. Therefore, data sources will generally reflect establishment-level data. This limitation is not expected to greatly impact the analysis as a large proportion of firms in many industries are comprised of single establishments.

The CCS team will run the REMI PI$^+$ and TS models for the SCAG region to simulate the changes in the local economy resulting from implementation of identified GHG mitigation and sequestration options.[2] The use of the REMI models will allow for estimation of the direct effects in the sectors in which the options are implemented, as well as multiplier, general equilibrium (price-quantity interactions), competitiveness (regional comparison) and macroeconomic (aggregate interactions) effects. Differences between a baseline model run and policy option-incorporated "counter-factual" model simulations yield the estimated economic impacts of alternative climate change policy actions.

The REMI model analysis will yield changes to numerous baseline outputs, including total Gross State Product and personal income. For the purpose of the firm-size impact analysis, key REMI model outputs will be changes in industry output and employment for each of the 169 sectors incorporated in the SCAG region REMI PI$^+$ model and each of the 70 sectors modeled in TS. The following section describes how these model outputs will be combined with estimates of SCAG region direct costs of policy options by firm size for affected industries to determine the impacts of policy options by industry- and firm-size category.

III. Additional Data Requirements

Two additional data elements are essential to the firm-size analysis:

1. The distribution of the direct costs of policy options by industry by firm size; and
2. SCAG region employment and sales by industry by firm-size category.

CCS will consult with SCAG as to the firm-size categories to evaluate. However, it will be necessary to restrict the potential firm-size categories to those available from SCAG's InfoUSA database.[3] Since the Small Business Administration (SBA) generally uses a 10o or 500 employee threshold to distinguish small firms from large firms, CCS suggests that SCAG consider at least three firm-size categories (one for firms of less than 100 employees, one for firms with less than 500 employees, and one for firms with 500+ employees). CCS recommends that the analysis be limited to no more than five firm-size categories because of the expected level of difficulty associated with developing cost estimates for affected industries by firm-size category for each policy option.

The Technical Work Groups (TWGs) will be most familiar with the details of each policy option, and are tasked with developing cost estimates for each option. Therefore, the TWGs will represent the most direct source of information on the firm-size distribution of these costs. The TWGs will be consulted for assistance in determining the proportion of total each policy option's costs/savings (or when these are not available, the proportion of each option's emissions reductions) attributable to the selected firm-size categories in the affected industries. When the TWGs are unable to develop this information, CCS will

[2] Energy impacts will be modeled with PI$^+$; transportation infrastructure impacts will be modeled with TS.
[3] Based on summaries of InfoUSA data provided by SCAG, data are available for 1-4; 5-9; 10-19; 20-49; 50-99; 100-249; 250-499; 500-999; 1000-4999; 5000-9999; and 10000+ employment size categories.

perform a literature review of earlier studies to determine whether relevant information is available. Such information would include the distribution of costs by firm size for similar policy options or characterizations of baseline emissions by source size. For example, a 2008 study by CCS team member Pechan characterizes energy costs by industry sector, firm size, and fuel type. In cases where such information is not identified in the literature, we will attempt to develop estimates based on GHG emissions data or other surrogate indicators of costs/emissions, such as county-level establishment size category employment data available from sources such as the U.S. Department of Commerce's *County Business Patterns* (DOC, 2010).

If relevant data can not be identified, CCS will assume that costs/savings are distributed in proportion to SCAG region sales by firm size in the affected industries (this latter option will be modified to exempt smaller firm sizes in cases where a mitigation option exempts small GHG emission sources). In these cases, CCS will compile industry-level firm sales data for the SCAG region from the 2008 InfoUSA database procured by SCAG (Lee, 2010). CCS will specifically utilize the InfoUSA data to develop SCAG region total sales estimates by North American Industrial Classification System (NAICS) code and selected firm-size categories. This step will necessitate estimation of sales data for SCAG region establishments in the InfoUSA database for which sales data are not reported. The InfoUSA data summaries provided by SCAG indicate that, with only a few exceptions, for each major economic sector and each county, sales data are reported for a majority of establishments in each firm-size category. Therefore, CCS believes that replacing the missing values with the average of the reported sales values will generally provide a reasonable estimation approach.[4]

CCS will then develop values for each policy option that represent the affected industries' estimated proportion of total industry costs (or revenues if a policy option results in a cost savings) attributable to each firm-size category. These proportions will then be used to allocate the REMI PI^+ model and TS model industry sector employment/output increases/decreases to firm-size categories. CCS will also compile SCAG region employment by industry by firm-size category. These values will be used to determine whether the estimated employment impacts fall disproportionately on small size firms (as measured relative to the contribution that small firms make to total employment in the affected industry). Further explanation of the proposed methods is provided in the sample impact analysis described in Section V.

[4] CCS will consider alternative sources of average sales estimates from other information sources (e.g., the Risk Management Association's *Annual Statement Studies*) if any InfoUSA-based averages would reflect data from less than 3 establishments for a given economic sector/firm-size category.

IV. Results

The firm-size analysis will develop estimates of total costs/savings by industry- and firm-size category for each policy option. These are values that are needed as inputs to the impact analysis. The firm-size impact analysis will produce estimates of employment/output changes by industry sector by firm size for each separate policy option modeled in the macroeconomic impact analysis. Furthermore, the analysis will produce employment/output changes by industry and firm size for all sets of policy options that are modeled together in a REMI PI$^+$ or TS model run. For example, the aggregate firm-size impacts of all energy-related mitigation/sequestration policies can be developed from a macroeconomic impact REMI model run that incorporates the effects of all such policy options. CCS will ultimately produce tables displaying estimated employment/output changes by firm-size category for all NAICS codes output by the two REMI models. CCS will analyze this information to identify any policy options/industries that result in a disproportionate share of impacts on small firms (relative to their share of total industry sector employment).

V. Example Impact Analysis

The following provides a hypothetical example to further illustrate the firm-size impact methodology. The analysis relies on cost estimates for a given policy or set of policies, as developed to support the macroeconomic impact analysis. For the purpose of this example, we will assume that an Energy Efficiency program is the policy option analyzed, and that the total costs for this program were estimated as inputs to the REMI PI$^+$ model over the full time horizon (2010-2020) of the macroeconomic impact analysis. CCS will request that the TWG analyzing this policy option determine the proportion of these Energy Efficiency (EE) program's costs that are attributable to the selected firm-size categories in the affected industries. For the purpose of this example, we will assume that impact estimates will be developed for three firm-size categories:

- Firms with less than 100 employees;
- Firms with less than 500 employees; and
- Firms with 500 employees or greater.

The first two of these firm-size categories are intended to represent two alternative definitions of a small firm. In this simplifying example, we assume that the total EE program costs over the analysis period are as reported in Table 1.[5]

[5] An EE program will actually affect many more manufacturing and commercial sector industries than presented in this hypothetical example.

Table 1. Estimated Distribution of EE Program Costs (in 2010$) by Industry Sector and Firm-Size Category

Sector	Less than 100 employees	Less than 500 employees	500+ employees
NAICS 3273-Cement and Concrete Product Manufacturing	$10 million	$40 million	$200 million
NAICS 3364-Aerospace Product and Parts Manufacturing	$25 million	$60 million	$190 million
NAICS 622-Hospitals	$10 million	$150 million	$500 million
NAICS 721-Accommodation	$25 million	$100 million	$300 million

The macroeconomic impact analysis will generate both a baseline forecast that reflects PI$^+$ model policy variables set to their baseline values, and an alternative forecast that revises the policy variable values to account for the direct effects of the EE program. In this hypothetical example, CCS would enter the total sector-level cost estimates into the REMI PI$^+$ model (e.g., $240 million for NAICS code 3273), along with other necessary inputs to fully model the direct effects of the EE program (e.g., increase in the final demand for goods and services from the industries that supply energy efficient equipment and appliances). The impacts of the EE program are measured by comparing the baseline forecast and the alternative forecast. For the purpose of this firm-size impact analysis example, Table 2 displays the hypothetical PI$^+$ model estimated impacts of the EE program on industry output and employment.[6]

Table 2. Estimated SCAG Region EE Program Impacts (in 2010$) by Sector

Sector	Output Change (2010$)	Employment Change
NAICS 3273-Cement and Concrete Product Manufacturing	-$10 million	-200 employees
NAICS 3364-Aerospace Product and Parts Manufacturing	-$5 million	-100 employees
NAICS 622-Hospitals	-$3 million	-300 employees
NAICS 721-Accommodation	-$20 million	-500 employees

Table 3 presents the estimated employment impacts of the EE program in the SCAG region by industry sector and firm-size category. These estimates are derived by allocating the Table 2 employment impacts to firm-size categories based on the Table 1 distribution of EE program costs by firm-size category. Using an analogous procedure, CCS can also provide SCAG with a table displaying the change in output by firm-size category.

[6] In reality, it would be expected that EE program impacts will extend to other sectors beyond those directly affected by the program due to various indirect effects resulting from the interdependence of the economy.

Table 3. EE Program Employment Impacts by Industry Sector and Firm-Size Category

Sector	Less than 100 employees	Less than 500 employees	500+ employees
NAICS 3273-Cement and Concrete Product Manufacturing	-8 employees	-33 employees	-167 employees
NAICS 3364-Aerospace Product and Parts Manufacturing	-10 employees	-24 employees	-76 employees
NAICS 622-Hospitals	-5 employees	-69 employees	-231 employees
NAICS 721-Accommodation	-31 employees	-125 employees	-375 employees

To determine whether the EE program will disproportionately impact small firms, Figures 1 through 4 present a comparative analysis of employment impacts for large versus small firms. These figures provide comparisons of the percentage of total baseline employment attributable to small versus large firms, as well as the percentage of total EE program employment impacts attributable to small versus large firms.[7] The analysis for this hypothetical example indicates that the EE program is not generally expected to result in changes in employment that disproportionately impact small firms. The lone exception is the smallest firm-size category (less than 100 employees) for the Aerospace industry: although firms of this size only account for 7.5 percent of total industry employment, they are projected to incur 10 percent of total industry employment losses.

Although the hypothetical example discussed in this section performs the firm-size impact analysis for each individual affected industry sector, for policy options that affect numerous sectors, to more clearly provide a single overall assessment of firm-size impacts, SCAG may prefer to have the analyses performed using aggregate data from all affected sectors. Figure 5 presents the results of this approach for the example EE program impact analysis.

[7] Small firms defined as those with less than 100 or less than 500 employees, and large firms defined as those with 500+ employees.

Figure 1. Comparison of Baseline Employment and EE Program Employment Impacts for Cement Industry by Firm-Size Category

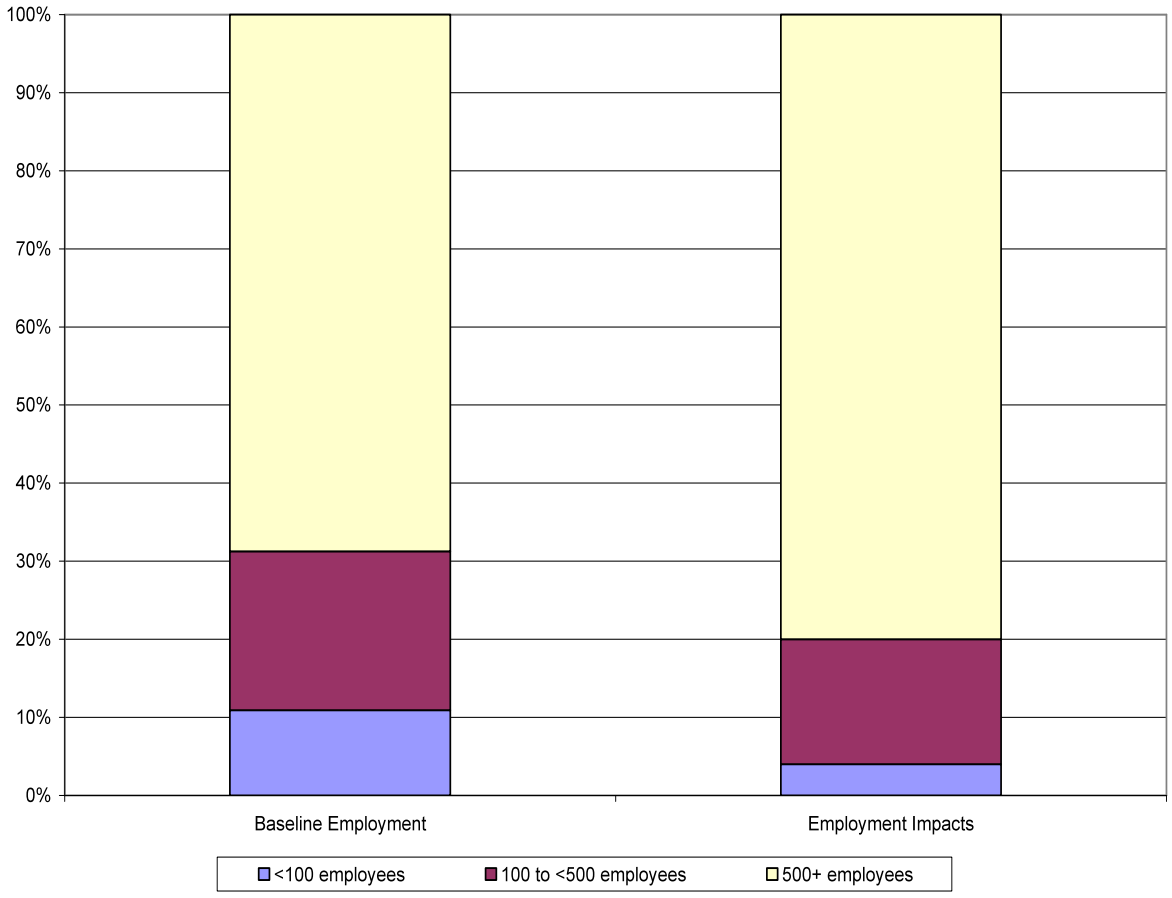


Figure 2. Comparison of Baseline Employment and EE Program Employment Impacts for Aerospace Industry by Firm-Size Category

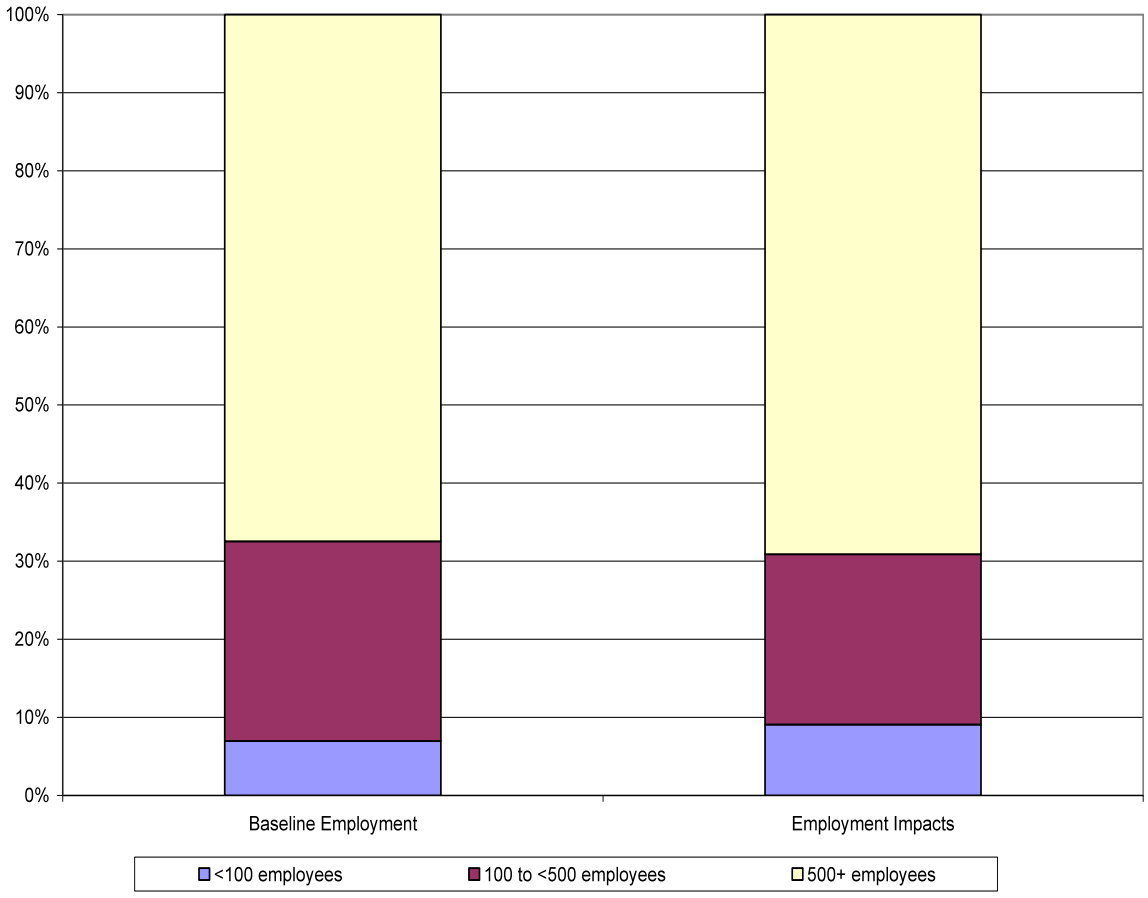


Figure 3. Comparison of Baseline Employment and EE Program Employment Impacts for Hospitals Industry by Firm-Size Category

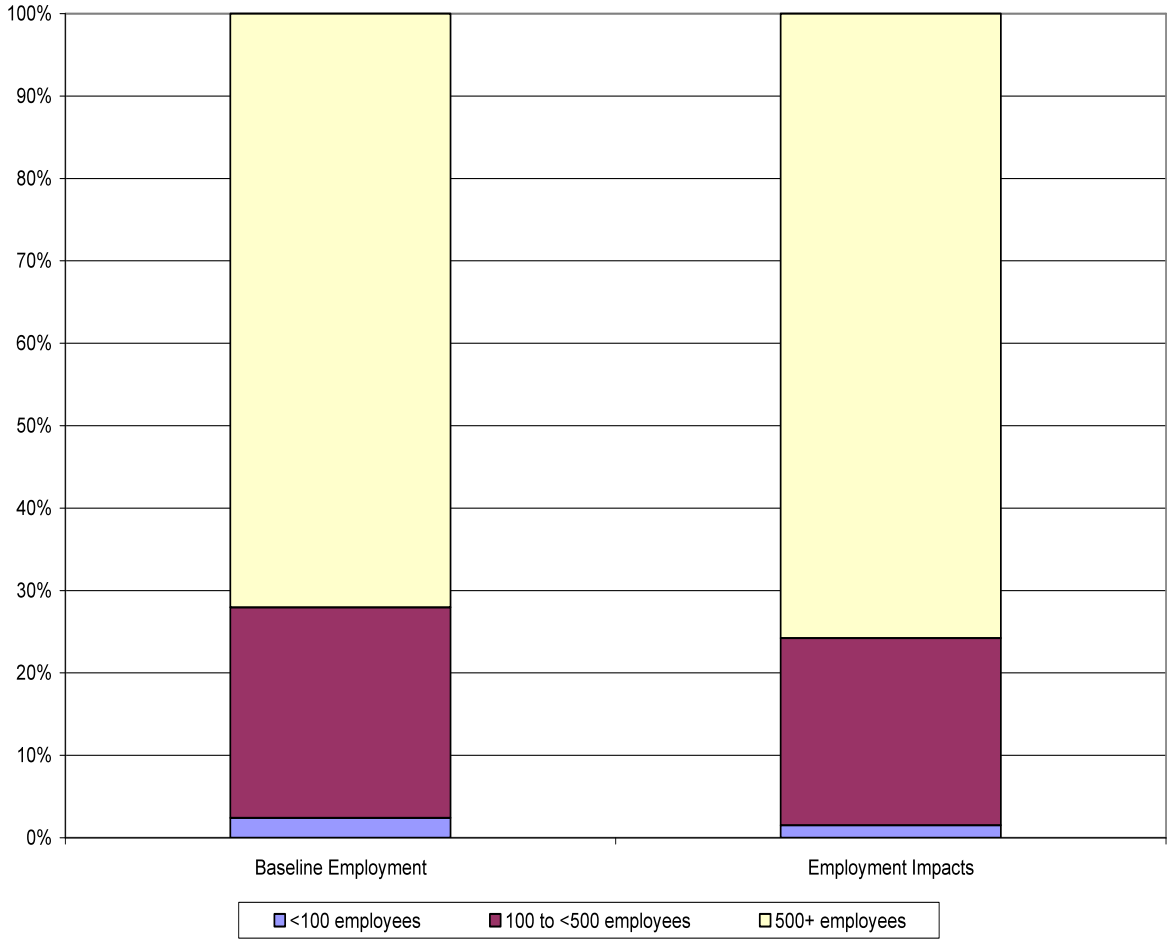


Figure 4. Comparison of Baseline Employment and EE Program Employment Impacts for Accommodation Industry by Firm-Size Category

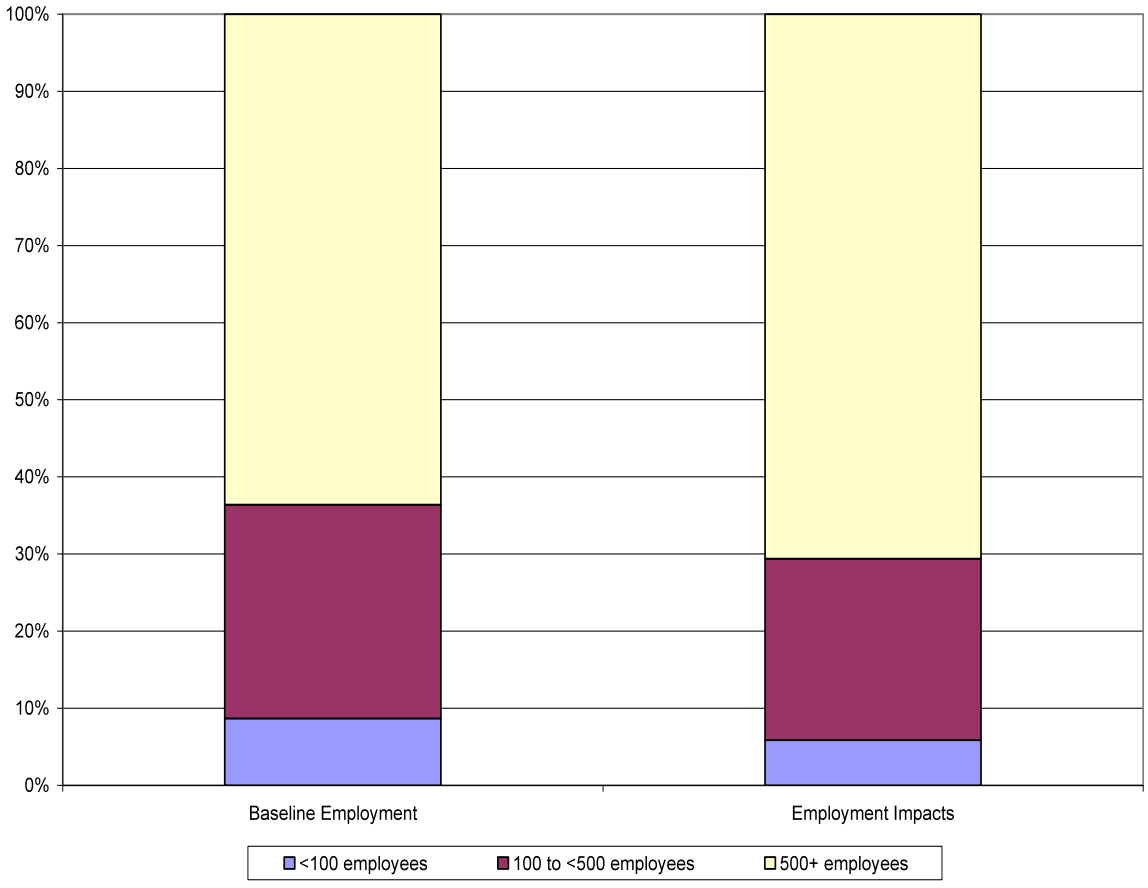
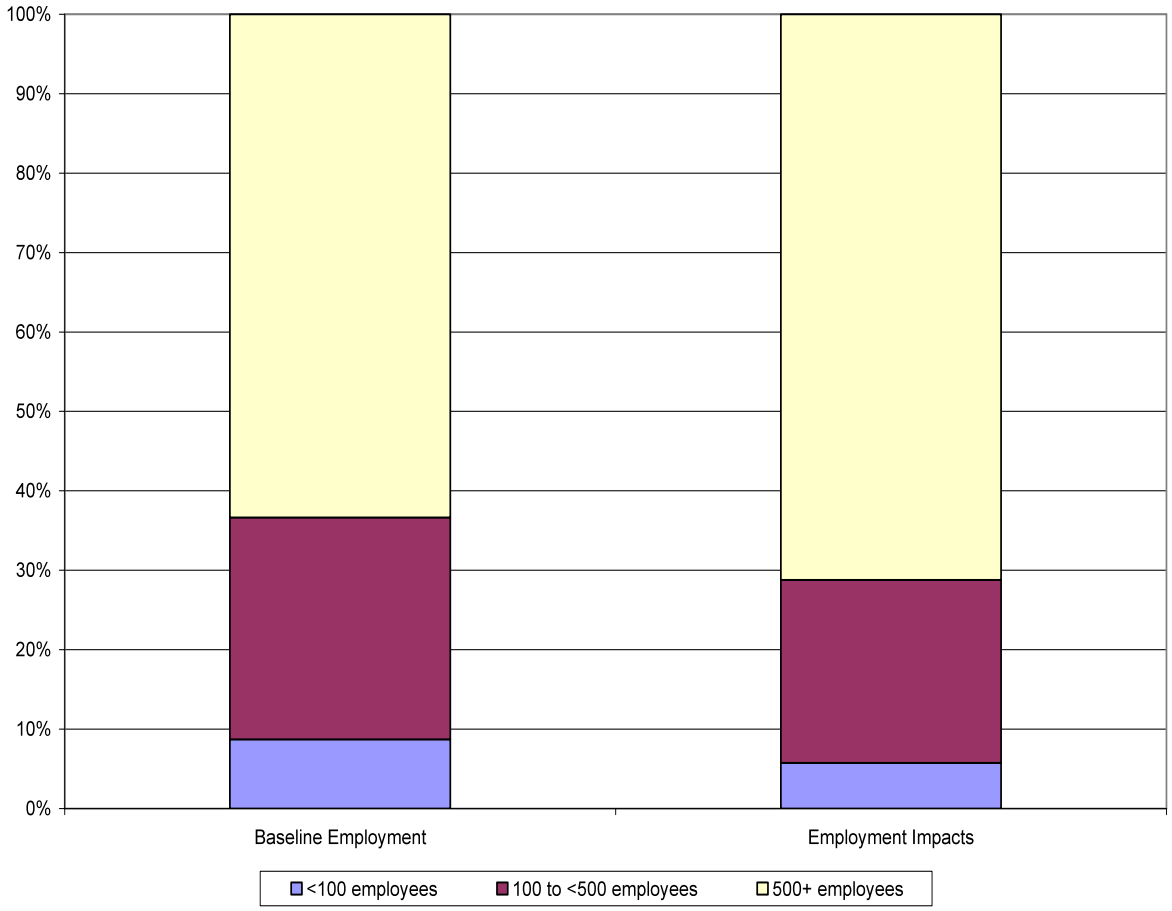


Figure 5. Comparison of Baseline Employment and EE Program Employment Impacts by Firm-Size Category: All Affected Industries



VI. References

Center for Climate Strategies (CCS). 2010. Draft Macroeconomic Impacts of AB 32 & SB 375 on the SCAG Economy: Methodological Summary, June 15, 2010.

U.S. Department of Commerce (DOC). 2010. *County Business Patterns*, http://www.census.gov/econ/cbp/index.html.

Lee, Cheol-Ho. 2020. Description and sample *InfoUSA* data provided by Cheol-Ho Lee, Southern California Association of Governments to Andy Bollman, E.H. Pechan & Associates, Inc.

Regional Economic Models, Inc. (REMI). 2010. *REMI PI^{+} Model*. http://www.remi.com/index.php?page=pi-plus&hl=en_US.

Regional Economic Models, Inc. (REMI). 2010. *REMI TranSight (TS) Model. Model*.http://www.remi.com/index.php?page=transight&hl=en_US.